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# Long-term Walking Exercise May Affect Some Physical Functions in the Elderly

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**KEYWORDS** Walking. Physical Activity. Balance. Flexibility. Lung Functions. Strength

**ABSTRACT** The aim of this study was to investigate the effects of six months of regular walking exercise on lung capacity, muscle strength, flexibility, body percent fat, balance and physical activity levels of older people aged over 65 years old. Subjects were recruited from 30 women volunteers aged over 65 years old in a Nursing Home. Participants were invited to join a 6-month walking exercise by meeting three times a week. The Forced Vital Capacity (FVC), sit and reach, Body Fat Percentage (BFP), handgrip strength, get up go and number of steps were measured before exercise, and after 3 and 6 months of exercise. There were significant differences in FVC, sit and reach, BFP, get up go, and number of steps ($p<0.05$) in exercise group between time trials. There were no significant differences between pretest and posttest in the control group except for the sit and reach test measurement. Long-term walking exercises can be helpful for older people as they increase their physical functions.

## INTRODUCTION

The percentage of people aged over 65 years old has been steadily and dramatically increasing in the world. There are many studies on the positive effects of regular exercise for elderly and the public is becoming aware of the role of exercise in increasing the quality of life for elderly people (Norman 1995; Kilinc 2014).

With aging, there are many changes that occur including both physical fitness levels and health status of elderly people (Irez 2014; Narcis 2015). One of them is muscle mass, because it has an important role for both aerobic and anaerobic capacity, and it decreases with a sedentary life in aging (Martin 1991). Middle-aged and older adults who participate in regular aerobic exercises have much lower prevalence of illnesses like cardiovascular diseases, lung problems, diabetes, and hypertension than sedentary older people of the similar age may suffer (ACSM 1998).

Designing and maintaining muscle strength, aerobic capacity and flexibility is important in a comprehensive exercise program for elderly. Activities such as walking, jogging, running, aerobic endurance and resistance exercises are an excellent choice when performed regularly for elderly (Duncan et al. 1991).

Regular walking has an important way to improve the health condition of older people by increasing physical activity levels (Lee 2005). Research on more effective physical activity applications that improve long-term participation to regular exercise to a physically active lifestyle is urgently needed. There are some studies (Shin 1999; Awick et al. 2015; Voukelatos 2015) about walking exercises but not much has been found in literature on long duration of regular walking exercise over 65 years old people. The purpose of this study to investigate the effects of 6 months of regular walking exercise on lung capacity, muscle strength, flexibility, body percent fat, balance and physical activity levels of older people aged over 65 years of age.

## METHODOLOGY

### Participants

The sample was randomly divided into an exercise group (n=15 women) and control group (n=15 women). The control group continued their lifestyle while the exercise group participated in regular walking exercises. None of the subjects had neurologic and orthopedic conditions that could influence participation in the exercise program.

### Exercise Program

According to the exercise protocol, subjects participated three times a week in an exercise

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program during six months and each exercise session took about 45 to 50 minutes. This phase was divided into two parts: 1) Warm up (30 min. low intensity walking), and 2) 10 minutes of stretching and calisthenics exercise.

## Procedures

Pretest, mid-test and posttests were performed by measuring the forced vital capacity (FVC) with a flow meter, and the dominant handgrip strength was measured using the handgrip dynamometer (Tamer 2000; Kilinc et al. 2014). Flexibility was measured by the "sit-and-reach" test (Irez et al. 2011), and body fat measurement was performed by using the Tanita body fat analyzer while balance measurement was performed with get up go test.

***Height (cm) and Weight (kg) Measurements:*** Height was measured by using a stadiometer. Weight was measured using an electronic scale (Seca Corp, United Kingdom).

***Forced Vital Capacity (FVC):*** Forced Vital Capacity was measured by using flow meter. It is a handheld device and used to measure a person's ability to breathe out air (Tamer 2000).

***Sit and Reach Test:*** Flexibility was measured using the sit and reach test with applying its procedure. The best of trials was recorded (Zorba and Saygin 2013; Haugen et al. 2014).

***Handgrip Strength Test:*** The handgrip strength of the dominant hand was evaluated using a handgrip dynamometer (Takei, Japan). The test was performed in the standing position. The test was repeated twice with the dominant hand and the best performance was recorded (Tamer 2000; Kilinc et al. 2014).

***Body Fat Analyzer:*** The bioelectrical impedance (Tanita TBF- 401A, Tokyo, Japan) device for used to analyze body fat percentage. The analyzer produces a printout with data of the body fat after every measurement (Prins et al. 2008).

***Get Up Go Test:*** Performers sat back in a standard armchair and started walking with the "go" command for 3 meters and then walked back the chair and sat (Mathias et al. 1986; Kilinc et al. 2014).

***Physical Activity Level (PAL):*** PAL was measured using the pedometer (three times in a week; two days in a week and a day in weekend). The physical activity level was assessed through the number of steps taken using a Yamax Digiwalker (Model SW-200, Japan) pedometer. According to protocol, they were told to wear the pedometer from the time they woke up until they went to bed. They were worn on two days in a week and one weekend and the total number of steps was recorded during each day (Lee 2005; Kim and Lee 2010).

## Statistical Analyses

Repeated measures ANOVA with the Tukey post hoc comparisons applied the analysis by using the SPSS 18 statistical packages. Post-hoc comparisons were performed to identify between group differences ($p<0.05$).

## RESULTS

The participants of the exercise group had a mean age of 74.82±8.78 years and the control group's mean age was 75.53±7.21 years. During the pre-test, mid-test and post-test of the exercise group, the measurements were found to be 63.55±11.39 kg, 62.84±10.12 kg, 62.02±10.42 kg, respectively, and the pre-test, mid-test and post-test results of the control group were found to be 64.80±10.16 kg, 64.25±10.19 kg, 65.10±9.86 kg, respectively (Table 1).

There were significant differences in the exercise group's test of within subjects on forced vital capacity ($F=11.50$, $p<0.05$). The post hoc test (Tukey) resulted that these differences between T1 and T3 measurements. Another signif-

**Table 1: Some physical characteristics of participants**

| *Experiment group* | *X* | *SD* | *Control group* | *X* | *SD* |
|---|---|---|---|---|---|
| Age (year) | 74.28 | 8.78 | Age | 75.53 | 7.21 |
| Height (m) | 1.54 | 0.09 | Height | 1.53 | 0.11 |
| Pre-test-weight (kg) | 63.55 | 11.39 | Pre-test-weight | 64.80 | 10.16 |
| Mid-test-weight (kg) | 62.84 | 10.12 | Mid-test-weight | 64.25 | 10.19 |
| Post-test- weight (kg) | 62.02 | 10.42 | Post-test- weight | 65.10 | 9.86 |

icant difference was found that in the sit and reach variable (F=35.21, p<0.05), get up go test (F=23.9, p<0.05) and number of steps (F=14.56, p<0.05) in post hoc test differences were found between all times (T1, T2, and T3). Moreover, the body fat percent (F=10.95, p<0.05) decreased with time while physical activity levels (F=14.56, p<0.05) increased from the first measurement to third measurement. There was no significant difference in handgrip strength performance (Table 2).

There were no significant differences in control group's variables (FVC, hand-grip strength, BFP, get up go and number of steps) (p>0.05), although it was found to be significantly different in the sit and reach test measurement (F= 10.21, p<0.05). The mean differences result of flexibility negatively decreased with time in the control group (T1-T3, T2-T3) (Table 3).

## DISCUSSION

The present study investigated the effects of 6 months of regular walking exercise on the lung capacity, muscle strength, flexibility, handgrip strength, body percent fat and physical activity levels of people aged over 65 years old. The present results showed that significant differences were found in BFP, sit and reach, get up go, number of steps and lung functions although there were no significant differences in the control group's result except in flexibility (Tables 2 and 3). De Melo et al. (2014) studied to find cut off points of physical activity levels in older adults. They found scores for the number of steps with "insufficiently active" being up to 5,999 steps. In this study, it was found that exercise and control group's physical activity levels were insufficiently active relative to the cut off points of De Melo et al. (2014).

In literature, there are some similar findings with this present study. Shin (1999) investigated the impacts of a walking exercise program on physical function of older women. 27 females between the ages of 60 to 75 years participated to this study. $VO_2$max, resting pulse rate, blood pressure, FVC, $FEV_1$ for cardio respiratory function, flexibility were measured. It was found that the physical function of the experimental group improved significantly more than that of the control group. In this present study it was found that with the walking exercise, the flexibility and forced vital capacity increased in older adults who attended it. These findings show parallel results with this study.

**Table 2: Analyses of variables of exercise group with repeated measures of ANOVA and post hoc test**

| *Exercise group* | *Baseline measurement (T1)X±SD* | *Mid measurement (T2)X±SD* | *Post measurement (T3)X±SD* | *p* | *F* | *Post-hocTukey* |
|---|---|---|---|---|---|---|
| FVC(lt/min) | 2.63±0.85 | 2.71±0.82 | 2.95±0.81 | 11.50 | 0.04* | 1-3 |
| Sit and reach (cm) | 13.04±4.79 | 15.77±4.96 | 17.44±5.17 | 35.21 | 0.00* | 1-2,1-3,2-3 |
| Hand grip strength(kg) | 13.41±4.01 | 14.28 ±4.38 | 14.81±2.31 | 1.69 | 0.20 | N.S. |
| Body fat percent (%) | 34.96±7.20 | 33.22±8.11 | 31.55±7.50 | 10.95 | 0.04* | 1-3 |
| Get up go (sec.) | 15.63±4.78 | 12.89±4.24 | 11.17±3.85 | 23.92 | 0.00* | 1-2,1-3,2-3 |
| # of steps | 2785.72±1818.66 | 3074.10±2162.19 | 4445.08±2410.25 | 14.56 | 0.02* | 1-2,1-3,2-3 |

*p<0.05, N.S.: Not Significant

**Table 3: Analyses of variables of control group with repeated measures of ANOVA and post hoc test**

| *Control group* | *Baseline measurement (T1)X±SD* | *Mid measurement (T2)X±SD* | *Post measurement (T3)X±SD* | *p* | *F* | *Post-hocTukey* |
|---|---|---|---|---|---|---|
| FVC (lt/min) | 2.72±0.99 | 2.75±0.80 | 2.76±0.67 | 0.64 | 0.54 | N.S |
| Sit and reach (cm) | 14.94±4.18 | 13.45±5.78 | 12.01±3.52 | 10.21 | 0.02* | 1-3,2-3 |
| Hand grip strength(kg) | 13.79±6.04 | 13.09±4.36 | 13.66±4.99 | 0.03 | 0.96 | N.S. |
| Body fat percent (%) | 35.14±7.39 | 34.62±6.05 | 34.89.73±5.73 | 1.71 | 0.21 | N.S. |
| Get up Go (sec.) | 16.67±4.73 | 17.09±6.74 | 15.83±6.28 | 0.79 | 0.47 | N.S. |
| # of steps | 2956.26±996.85 | 3053.06±1021.39 | 2893.92±1015.13 | 2.34 | 0.13 | N.S. |

*p<0.05, N.S.: Not Signif

Johns and Pierce (2008) found the height of older women, forced vital capacity of women who are 70 years old, forced vital capacity of 75-year-old women to be 1.55m, 2.64t, 2.46lt, respectively. Rossi et al. (2008) found the age of the women to be 71.6±2.3 years, forced vital capacity of women to be 2.66±0.44lt, and after 7 years forced vital capacity of women to be 2.40±0.44lt. They found the age of men as 71.7±2.2years, forced vital capacity of men to be 3.83±0.57lt, and after 7 years, the forced vital capacity of men was 3.53±0.70lt. Another study was conducted by Schoenfelder (2000) to search the role of exercise to prevent falling and walking program to improve ankle strength, balance, falls efficacy and walking speed. In their study it was found that regular exercise prevents falls by increasing physical function. In another study, Hyun et al. (2014) found that the time-up go test times of elderly women were improved after Pilate's exercises during twelve weeks. This study shows similar results with these studies.

Kolt et al. (2012) studied the effectiveness of two physical activity prescriptions. The pedometer step-based and a standard time-based on physical activity and body mass index in low active older adults. In their study, the pedometer use resulted in a greater increase in leisure walking without any impact on overall activity level. In this study, the researchers could not study the effect of a pedometer use but used also pedometer to measure physical activity level and found that physical activity level was increased. Similarly in another study, Faber et al. (2006) performed a study to investigate the effects of moderate intensity group exercise programs on falls, physical performance, and disability in elderly. Number of falls and physical performance score variables were measured before and after a 20-week exercise program. They found that fall preventive moderate intensity exercise programs have positive effects on number of falling and physical functions.

Chung et al. (2012) studied the physical fitness levels of older adults and the ageing effect on health. They found that all age groups were overweight, except for women older than 84 years. In elderly women, a statistically significant decrease was found in balance and flexibility happened around the age of 55 years. In their study, lung capacity decreased around the age of 65 years and handgrip strength decreased around the age of 75 years.

Meijer et al. (1999) studied the impact of twelve weeks of exercise training on daily physical activity in elderly. Physical functions were measured before the starting exercise program, in the $6^{th}$ week and $12^{th}$ week in exercise group. No differences in physical activity between exercise and control groups were found. They found that an exercise training program of moderate intensity for the elderly resulted in an improved physical function but had no effect on the total daily physical activity. In another study, Narcis (2015) analyzed the impacts of a year of participation in a regular exercise intervention on physical functions of middle age and older adults. The exercise group (n=2614) performed an exercise program including walking, flexibility, strength and balance. They found that physical activity significantly improved all physical fitness parameters in the exercise group.

Kilinc et al. (2014) compared the effects of Pilate's and regular walking exercise program on strength, balance, flexibility, number of falls and fear of falling among the elderly. A total of 45 volunteers aged 65 years and older were selected randomly from the Nursing Home. Participants attended fourteen weeks of the exercise program of either Pilate's or walking 3 times per week. They concluded that Pilate's is very efficient way in improving certain physical fitness parameters among the elderly when compared with walking exercises. Therefore, Irez (2014) found significant differences in flexibility performance of over 65 years old people after 14 weeks of walking exercises. Cho et al. (2014) investigated effects of recreational physical activities on the balance, strength and flexibility of participants aged over 75 years. Their study concluded that an intervention using recreational physical activity effectively improves the balance, muscle strength and flexibility of older participants. Another study studied by Awick et al. (2015) aimed to analyze the relationship between quality of life and physical activity. They separated groups randomly as aerobic walking group and strengthening and flexibility (n = 179) for 12 months. The results were that the walking group gained a positive effect slightly more than the strengthening and flexibility.

Melzer et al. (2003) compared 22 healthy elderly individuals who walked on a regular basis with 121 healthy controls who did not walk regularly. The researchers found that participating in a regular exercise program increased muscle

strength and decreased the number of falls. Shin (1999) performed a study with participants between the ages of 60-75 years (8-week walking exercise program). The researcher found improvements in flexibility of elderly women. Hars et al. (2014) assessed the impact of long duration music based exercise on fall risk and physical fitness in elderly people. They found significant developments in the gait speed and balance (one-legged stance time) in the long-term exercise group. The results showed that that participants of long-term exercise did better on timed up-go and handgrip strength tests.

Mills (1994) investigated the impacts of low intensity aerobic exercise on balance, strength and flexibility in elderly. The researcher found that there was a significant difference in flexibility. There was no significant difference between the groups for muscle strength or balance, although the exercise group improved their balance. In this study similarly, in the exercise group there was no significant difference in muscle strength.

## CONCLUSION

Regular long-term walking exercises may be helpful for elderly people. They should be included in their daily routines. Moreover, this study suggests that regular exercise habits may be helpful with increasing muscle strength, flexibility, handgrip strength, body percent fat and physical activity levels of older people aged over 65 years old.

## RECOMMENDATIONS

Instead of walking exercise, different types of exercises with a large number of people should be included in other studies. Therefore, other physical and physiological parameters, which are important for older people, should be selected and measured. In future studies, gender differences should be analyzed for older people.

## REFERENCES


ACSM 1998. Position stand: Exercise and physical activity for older adults. *Med Sci Sports Exerc*, 30: 992-1008.

Awick EA, Wojcicki TR, Erin AO, Jason F, Hyondo D et al. 2015. Differential exercise effects on quality of life and health-related quality of life in older adults: A randomized controlled trial. *Qual Life Res*, 24: 455–462.

Cho SI, An DH, Yoo WG 2014. Effects of recreational exercises on the strength, flexibility, and balance of old-old elderly individuals. *Journal of Physical Therapy Science*, 26(10): 1583-1584.

Chung LMY, Chung JWY, Wong TK 2012. Association of physical fitness and ageing among older Chinese people. *Asian Journal of Gerontology and Geriatrics*, 7(2): 69-79.

De Melo LL, Menec VH, Ready AE 2014. Relationship of functional fitness with daily steps in community-dwelling older adults. *Journal of Geriatric Physical Therapy*, 37(3): 116-120.

Duncan JJ, Gordon NF, Scott CB 1991. Women walking for health and fitness: How much is enough? *JAMA*, 266: 3295-3299.

Faber MJ, Bosscher RJ, Chin A Paw MJ, van Wieringen PC 2006. Effects of exercise programs on falls and mobility in frail and pre-frail older adults: A multicenter randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 87(7): 885-896.

Hars M, Herrmann FR, Fielding RA, Reid KF, Rizzoli R et al. 2014. Long-term exercise in older adults: 4-year outcomes of music-based multi task training. *Calcified Tissue International*, 95(5): 393-404.

Haugen T, Hoigaard R, Seiler S 2014. Normative data of BMI and physical fitness in a Norwegian sample of early adolescents. *Scandinavian Journal of Public Health*, 42(1): 67–73.

Hyun J, Hwangbo K, Lee CW 2014. The effects of pilates mat exercise on the balance ability of elderly females. *Journal of Physical Therapy Science*, 26(2): 291-293.

Irez GB 2014. The effects of different exercises on balance, fear and risk of falling among adults aged 65 and over. *Anthropologist*, 18(1): 129-134.

Irez-Babayigit G, Ozdemir R.A, Evin R, Irez SG, Korkusuz F 2011. Integrating pilates exercise into an exercise program for 65+ year-old women to reduce falls. *Journal of Sports Science and Medicine*, 10: 105-111.

Johns DP, Pierce MD 1995. *Spirometry: The Measurement and Interpretation of Ventilatory Function in Clinical Practice.* Australia: National Asthma Campaign.

Kilinc H, Babayigit-Irez G, Saygin O 2014. Swissball ve theraband egzersizlerinin 65 yas ustu bireylerin yasam kalitesi ve bazi fiziksel ozelliklerine etkileri. *International Journal of Human Sciences*, 11(2): 668-680.

Kim CG, Lee YS 2010. Use of a pedometer to monitor physical activity in older adults: A pilot study. *Southern Online Journal of Nursing Research*, 10(1).

Kolt GS, Grant M. Schofield GM, Kerse N, Garrett N et al. 2012. Healthy steps trial: Pedometer-based advice and physical activity for low- active older adults. *Ann Fam Med*, 10(3): 206-212.

Lee YS 2005. Gender differences in physical activity and walking among older adults. *Journal of Women Aging*, 17(1-2): 55-70.

Mathias S, Nayak USL, Isaacs B. 1986. Balance in elderly patients: The “get-up and go” test. *Arch Phys Med Rehabil*, 67: 387-389.

Martin J 1991. The effects of age and exercise on short term maximal performance: A model based on

physiological systems. *Medicine in Sport*, 23(3): 66-69.

Meijer EP, Westerterp KR, Verstappen FT 1999. Effect of exercise training on total daily physical activity in elderly humans. *European Journal of Applied Physiology and Occupational Physiology*, 80(1): 16-21.

Melzer I, Benjuya N, Kaplanski J 2003. Effects of regular walking on postural stability in the elderly. *Gerontology*, 49: 240–245.

Mills EM 1994. The effect of low-intensity aerobic exercise muscle strength, flexibility, and balance among sedentary elderly persons. *Nurs Res*, 43(4): 207-211.

Narcis G, Miguel A. Hernandez M, Pedro RO 2015. Changes in HRQoL after 12 months of exercise linked to primary care are associated with fitness effects in older adults. *European Journal of Public Health*, 25(5): 873-879.

Norman KAV 1995. *Exercise Programming for Older Adults*. IL/USA: Human Kinetics Champaign.

Prins M, Hawkesworth S, Wright A, Fulford AJC, Jarjou LMA et al. 2007. Use of bioelectrical impedance analysis to assess body composition in rural Gambian children. *European Journal of Clinical Nutrition*, 62(9): 1065-1074.

Rossi A, Fantin F, DiFrancesco V, Guariento S, Giuliano K et al. 2008. Body composition and pulmonary function in the elderly: A 7-year longitudinal study. *International Journal of Obesity*, 32(9): 1423-1430.

Schoenfelder DP 2000. A fall prevention program for elderly individuals. Exercise in long-term care settings. *Journal of Gerontological Nursing*, 26(3): 43-51.

Shin Y 1999. The effects of a walking exercise program on physical function and emotional state of elderly Korean women. *Public Health Nursing*, 16(2): 146-154.

Tamer K 2000. *Sporda Fiziksel ve Fizyolojik Performansin Olculmesi ve Degerlendirilmesi*. Ankara: Bagirgan Yayimevi.

Voukelatos A, Merom D, Sherrington C, Rissel C, Cumming RG et al. 2015. The impact of a home-based walking programme on falls in older people: The Easy Steps randomised controlled trial. *Age and Ageing*, 4(3): 377-383.

Zorba E, Saygin O 2013. *Fiziksel Aktivite ve Fiziksel Uygunluk*. Ankara: Firat Matbaacilik.